

Out of Touch?

A Study of the Technology and Framework
That Is Supposedly Killing Music

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Abstract

Since the 1990-s music has become more and more polished, to the point where it is almost *too perfect*. Are we obsessed with perfection, both in structure and pitch? Auto-tune, playback and excessive compression are tools used in all genres, but most commonly seen in pop music. What is the fascination with everything being perfect and flawless? Is not the human part of music important today?

This essay examines the “human touch” in music from different perspectives to establish a conclusion regarding the state of it. There are many factors that affect the human touch and this essay is based on four that I believe to be the main factors.

Authenticity and perfection are key factors when discussing “humanity” and the human touch in music. Is music today still authentic, even with all the software manipulation and polishing tools? This essay has used academic works from different musicologist to first establish what authenticity is and how it has developed in the digital era.

During the analysis I took a closer look at the most criticized and well known tool during music production, pitch correction. This analysis gives an overview of what can be done using pitch correction software such as Auto-tune, Melodyne and Waves Tune. These programs also provide graphs and curves for further analysis in terms of pitch and modulation. The graphs turned out to be excellent material for spotting track manipulation, without even listening to the track.

The result of the main questions point towards pitch-correction and perfection being the logical route of music development and the evolution of technology in general. The framework surrounding authenticity feels dated and hard to apply to new, digital music. Tools that would by the old standard make a performance or recording un-authentic should today be seen with fresh eyes and more as a diverse utensil rather than just a cheat. The human touch proved to be a very hard thing to both fake and remove from music, no matter how much you manipulate it. It is hard to have a subjective opinion regarding the state of authenticity of a track in today’s music, and it is safe to say that most musicians and producers today are not having authenticity in mind when creating or recording music. Perhaps this means that being unaware of authenticity and being genuine is the most honest way of being an authentic musician.

Preface

I would like to thank Lund University, Professor John Howland, Thomas Olsson and the MUVK01 class for making this essay possible. It has been a great learning experience that has given me tons of new knowledge to use in my personal life.

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Introduction

Are we actually starting to lose the human touch in music? If we look at the way music has been developing in the digital era it might actually seem that way. Songs are getting more polished and perfect, more tools are introduced to remove the small mistakes that set us apart from the digital world. Auto-tune and pitch correction has become the norm in almost every big genre, and it is rare to hear a pop tune that has not been pitch corrected and compressed to perfection.

Why have we become so obsessed with this “perfection” in music; is it not the small mistakes that will be remembered and that makes music unique? Things like slight variations, the silent count-ins and the false notes are the artifacts that lets us know that we are in fact human and not machines.

The “cleanness” of pop music has become almost sterile, most studios and music producers are simply following a recipe when inside the studio environment. To follow the so called “pop music formula” is nothing new, but with the digital tools of the modern world and the accessibility of these advanced tools everything has a tendency of sounding the same.

This “sterilization” might not be a problem per se, but it makes you wonder. Are we losing the human touch in our music? The human part, the analog aspect, the mistakes, how important are they really? Most of the manipulation and editing work is done in the post process, how does that affect the authenticity of the music?

When reading and researching pitch correction and polishing in music it is almost exclusively about what you can accomplish with today’s advanced technology. With the right tools and experience you could in theory make any singer sound “good” (Upvenue 2015). But what is good, really? I used the word polishing for a reason; when you polish something, you also take something away; the same goes for music. The layer of personality, uniqueness and human touch has a tendency to get wiped away along with the polishing and cleaning. Is that layer not wanted anymore, or is it simply because people cannot sing these days? Joking aside, this layer is something that I feel is being more and more erased both from today’s pop music and in music in general. This change has been exponential along with the development of software and manipulation programs such as Auto-tune, Melodyne and Waves-Tune and also with the rise of home studios. The accessibility of those tools and possibilities have become extreme to the point where almost anybody with a MIDI-keyboard and a DAW can create a commercially acceptable song.

This essay examines the layer that I chose to call the “human touch” in music and how this quality affects music recording practice in general. Is it something we still care about, or have ever cared about?

Hypotheses and questions

Throughout this essay I will illustrate the different perspectives that I believe to be the defining factors of the Human touch in music. With each perspectives follows a question that directly correlates with my idea of the human touch.

- Authenticity – A theoretical perspective
 - Can a pitch corrected and manipulated track still be regarded as authentic?
- Perfection – A psychological perspective
 - Is the “natural sound” starting to die out or is it simply not wanted?
 - Pitch correction is being used as a first resort instead of a last. Why is this?
- Pitch obsession – A technical perspective
 - Is it possible to spot vocal manipulation simply by looking at the spectrograms or waveforms?
 - Is it possible to fake the human touch or to remove it using modern technology?
- The Human Factor – A philosophical Perspective
 - What is the human factor in music and is it starting to get replaced by technology?

Background

In this chapter I will be discussing the background and theories behind this bachelor thesis. I will also take into consideration the factors, risks and obstacles that I tackled during the writing of this.

When I was 12 I started to discover music in a different way. I have always, or for as long as I can remember, been obsessed with music; much thanks to my dad for always having Beatles or Dylan blasting through the speakers at our house. Around the same time I started noticing things in music, things that might have not been the first thing you hear. Small artifacts, small mistakes, things that make a particular song stand out, or that makes you wonder, why did they leave that in, or why did they add that? These artifacts are starting to, or have been fading away for a long time in my opinion. Today it is more important to achieve a perfect sound, a perfect take or at least as close to it as possible.

This evolution is not only very interesting, but it is also what sparked my interest in writing this essay. What is more interesting is that this phenomenon is not exclusive to pop music.

This trend, the so called “perfection” trend is seen in almost every genre. I, being a fan of virtuosity and technicality was rather surprised when I found out how much post-processing there was behind my favorite metal or progressive rock music. Not only is there vocal manipulation, such as pitch shift and Auto-tune, but there are so many shortcuts used to achieve that sterile and artificial sound. The fact that MIDI-drums have become acceptable in professional recordings and, as of lately also amp simulations such as AXE FX and Kemper is not nearly as big of a surprise as the “copy-paste” trend that came along with the EDM and “home studio” trend. You could without, any problems make almost any genre of music with solely the help of a computer. The question is whether this has changed the way we listen to, or even view music?

I have chosen to call this phenomenon the human touch based on the fact that it is basically what it is, namely the human interference with music; from the pluck of a string or the grit of the voice to the press of a MIDI-keyboard. The “amount” of human touch is like authenticity a subjective and frameless thing. With this essay I am hoping to bring some new light on the matter.

Material and Method

The research part of the essay is divided into four different sections that each discusses the human touch in music from a different unique perspective. The majority of the theoretical material is based around previously published research in similar areas such as authenticity, musicology and psychology in music. The analysis section was done using several different software, plugins and original analysis methods. The programs used throughout the essay were Melodyne, Waves Tune and Auto-tune. The digital audio workstation used with these programs was Reaper.

The material surrounding authenticity and perfection were purely academic, while the analysis section used several magazine and internet articles discussing Auto-tune, pitch correction and virtual studio technology (VST) in general. Audio tracks were also used during the analysis sections to point out the use of different manipulation software.

Research

In my research I have looked at the different factors that in my opinion are the basis of the human touch in music. Starting with authenticity and moving on to perfection for an overview for the technical and analysis section.

The first two parts about authenticity and perfection deals with human touch in music from a theoretical point of view. The technical analysis is focused on how much can we actually learn from just looking at a sound wave, a spectrogram or the result of pitch correction software transfer. This is done with the aid of different examples of music and software. Lastly the human factors in music are discussed from a philosophical perspective.

What is authenticity in music?

What is real music and when or where does it cease to be real and authentic? What helps us define what is true to the music and what is not? The overall concept, which we refer to as authenticity, that is usually mentioned, is that of cultural capital, tradition, heritage and music. Authenticity is often mistaken for quality but has nothing to do with if the music is good or bad. Instead it should be seen of as truthful, honest and genuine and “from the heart”.

Upholding traditions is often said to be a central part of authenticity, which for example could mean that if a certain genre of music is played, an authentic performance of that genre will adjust according to the traditions of that genre. For example, an authentic jazz performance would generally not have distorted guitars and electronic drums (Moore 2002).

According to Professor David Machin the thought of authenticity goes back to the romantic era. The common belief was that true artistry was connected to the soul, and in that way also connected to God (Machin 2010, p. 14). Soul has still got a hold in the world of authenticity, especially when it comes to blues and music where the “feel” is important.

Since the blues is viewed as an authentic expression of an oppressed race - music from the heart – in contrast to the formality of the classical tradition of concert music from Europe, it is considered to be the archetype of the music that genuinely expresses true emotion and feeling. In the case of the boy band there is clearly an association of lack of this deeper expression of feeling (Machin 2010, p. 14).

According to Machin the way we think and listen to music is based on discourses that have been developing over time. The way we judge and feel when we hear a certain artist is based on the evolution on said discourses and it is never really clear why we react the way we do, it is simply how we've evolved (Machin 2010, p. 13). These discourses have then established a framework, or a way of thinking when we hear certain music. As Machin notes,

Discourses dominate the way we think about music. It is these discourses that tell us that a boy band does not produce music from the heart, whereas a blues artist does. In fact what we actually mean by such an evaluation is never clearly articulated. But nevertheless it can lead us to be less forthcoming in expressing our enjoyment of one of their songs and may even prevent us from enjoying it at all. (Machin 2010, p. 13).

Authenticity in correlation with the human touch

When researching authenticity in music it is usually the same names that keep discussing the same conclusions with the same perspectives, one of them being Allan Moore (2002) and the other being Simon Frith (1986). Together they have been a huge part of creating the framework that explains authenticity in music in the modern pop-music.

Following the methods of Moore, authenticity is not easily established by asking *what*, as in what music, but rather *who*. Beethoven played his music, wrote it and published it, and thousands of orchestras around the world have played his works over the years. Can those performances be regarded as authentic, or was it only authentic when Beethoven did it? According to Moore the cultural and historical factors weighs a lot heavier when defining authenticity in a piece of music. That brings the question, does *pitch* and software manipulation matter when following Moore's point of view? Or is Auto-tune regarded as a thing which would lift the authenticity in a song? These questions are looked more closely at under the technical section.

Even music that is clearly predictable can be thought of as being from the heart if it is in the right genre. I have sat in blues bars where the musicians looked and sounded like a cliché of blues. Yet from the facial expressions, movements and responses of the punters it was clear that they were witnessing music from the heart and certainly nothing contrived (Machin 2010, p. 16).

Bob Dylan is generally regarded as an authentic artist, although there are different kinds of authenticity, especially in his case. Looking closely at Dylan and his career reveals a sort of

paradox in the field of authenticity. In an interview the band Mumford & Sons claims that Dylan is in fact not authentic at all. He changed his name, he plays blues even though he is a white man from Minnesota. In that sense, he is not honoring the blues tradition in any way (Kravitz 2012). But according to Machin and Moore, being authentic can also be to play from the heart, or to simply give a sense of an authentic performance.

Looking more closely at Dylan's music, he is mainly using his voice, his guitar and his harmonica. The information found about his general recording and mixing processes indicates that there is very little editing and mixing after the actual recording process. Chris Shaw, who was an audio engineer for Dylan, explains this further and clarifies how the process was done and how demo versions and very rough takes often ended up as final mixes (Love 2008). Instead of doing loads of post-work on the songs most of the EQ and volumes are established by proper microphone placements and experimentation (Love 2008). An entire idea or concept could change in a matter of minutes, and that is what made his music so final and unique.

If that process were to change, would it affect the authenticity of his performance? Dylan's main source of authenticity was that he played from the heart and that he does so with a passion. If that factor was removed using post process effects and mastering methods, could it actually be possible to remove the authenticity from his performance? During the sections regarding perfection and software manipulation Dylan is one of the examples. If we add a lot of post-work, re-master the songs and add digital reverb to change the overall tone, in other words, remove everything that makes Dylan unique. If we also add Auto-tune to Dylan's vocals, changing his pitch and removing his natural vibrato, completely altering the feel and sound. Is the authenticity of his work still there? The human touch, the thing that we associate with Dylan is polished away completely in this modification process. The result is theoretically a digitalized shell that is just following the construct that we chose to call "correct" music and "the way it is supposed to sound" today. It makes you wonder how Dylan would have sounded if he was recorded and released today. Though he would not admit to being part of the pop-music scene, in retrospect and due to his popularity, he still was.

Authenticity and modern technology

As music has evolved, surely the framework surrounding authenticity in music followed along in some way? Musician and producer Brian Eno believes that technology has made us into perfectionists. In the past when mistakes were made during recordings, you either decided if

you wanted to do the whole song over again, or live with the mistake. Today you simply retune that note. Eno continues and asks the question, “Have we lost something of the tension of the performance, of the feeling of humanity and vulnerability and organic truth or whatever, by making these corrections?” (May 2015).

According to Eno artists should be aware of this phenomenon and think before using certain technology if they are striving for a certain sound. This has in itself started a trend to bring back the old, meaning in this case analog equipment. Famous musician Jack White for example, has no digital equipment and other musicians are going back to tape and track recorders just because they prioritize a sound that was once regarded as the authentic way (May 2015).

An introduction to perfection in music

Perfection does not have to do with just perfect pitch, but as of lately they tend to go hand in hand. Along with the pitch-perfect comes the spotless, compressed and flawless mixes we hear today. Drums are played using MIDI, guitars are being time stretched and copy-pasted and vocals are getting pitch perfected. This obsession with perfection in music is an interesting thing when put in perspective. In the 1960-s and 1970-s experimentation was a huge part of the music, it did not have to be perfect and it did not have to be in tune. Bands like the Grateful Dead simply went up to the stage and played together, seemingly without worrying about anything. So, where is this obsession coming from? Why are we so obsessed with removing what is essentially the “human touch”? This is not something that is exclusive to pop music, the new metal scene is “riddled” with all kinds of polishing effects and production shortcuts. Bands that do not use extreme amounts of compression or polishing tools are usually quick to tell you about their “raw sound”. Other artists simply follow along the stream of perfection because that has become the norm in most successful studios (Millner 2009, p. 185).

This strive for “perfection” is of course a result of the amazing technological evolution that has taken grip of the music production world. Most digital workstations contain the tools that are required to change certain parts instead of re-recording whole sections over and over.

The digital revolution

A simple explanation could be that it is just the way music has developed. Everything else is getting more high tech, so why should not music? Electronic music would be a perfect

example of this explanation. When the transition from analog to digital recording started in the 1950's everything pretty much changed (Banks 2013). Today most music is done on computers and the way we behave in the studio in the "digital era" is a completely different process. In the analog times everything was recorded onto physical components such as tape and vinyl. You recorded your part with the active effects like compressors, reverb and while it was in the mix you could change it, after that it was final and changing anything was an extremely tedious process. The control we have today, where we can zoom in on the actual sound waves and erase tiny artifacts and errors is just absurd in comparison. But that control also yields the perfect and flawless sound of today. And when the tools are so easily at our disposal, why should they not be used? If you know you have a slightly off beat drum, would it not be a stupid thing to record it all over again when you can simply move the track or beat slightly to correct it? (d'Escriván 2012, p. 9).

Pop music receives a great deal of negative criticism for using these methods of production, especially Auto-tune and pitch correction. But what about metal music? Most modern metal music is in many ways similar to modern pop music. Everything is perfected and compressed tightly before release (McElhearn 2014). In many cases the drums are not even played, but are instead composed using MIDI-software to achieve a tighter and cleaner sound.

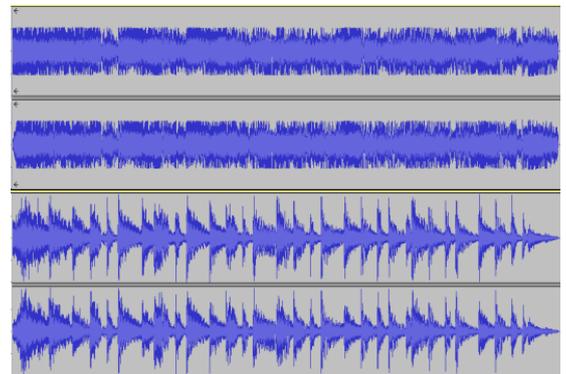


Figure 1 A compressed sound wave (top) and an uncompressed sound wave (bottom)

Compression is something that is used in every studio recording and as good as every home recording as well. Put in simple terms, a compressor compresses the sound. They reduce the dynamic range, giving the user the ability to increase the volume and gain in the process (Ferreira 2013, p. 73). The top and bottom are basically cut off to make more room for the core of the sound. In the 21 century compressors became available as software, unlike before when they were only in physical form. This really escalated the "loudness war" that started in the 90's and suddenly compressors were used in every situation (Dynamicrangeday 2011). The compression obsession constitutes of the "plastic" and "perfected" sound of pop music and in music in general. If too much compression is used, the dynamics of the song are so twisted that you end up with a flat, sterile mix (McElhearn 2014). In a way some of the music is actually lost because of the compression threshold giving the listener a less dynamic and "organic" experience.

The psychological factor

Using the manipulation methods mentioned above and later in the next chapter are by some people highly frowned upon, especially the use of Auto-tune. This is most likely due to the previously mentioned authentication discourses. An unnatural voice tends to sound less authentic in comparison to a clean, unprocessed one. Some even claim that the Auto-tune phenomenon ruined music (Futurism 2013).



Figure 2 A statement against the use of Auto-tune

In 2006 Craig Anderton wrote an article called “In Search of the Perfect Pitch”. One of his main points were that pitch correction is in many cases used before you try anything else. And according to him it should be regarded as a last resort and not as an easy fix. Josh Tyrangiel mentions that “You haul out Auto-Tune to make one thing better, but then it is very hard to resist the temptation to spruce up the whole vocal, give everything a little nip-tuck.” (Tyrangiel 2009). There are many factors that come in to play, and if the goal is to achieve a natural and more authentic sound pitch correction should be the last resort. But in the same way, it should not be excluded simply based on the amount of criticism it has received over the years (Anderton 2006)

To understand the criticism towards Auto-tune and pitch correction one needs to see all sides of the spectrum. First of all, the negative criticism is almost exclusively directed towards the use of Auto-tune and pitch correction in pop music, not other genres. When an artist is criticizing the use, it is generally an artist that is known to be a good singer, such as Michael Bolton or Michael Bublé (Wheeler 2013). Producer and pop-icon Simon Cowell made a statement when he officially banned the use of Auto-tune from the pop-music centered program “The X Factor”. He did this after he learned that pitch correction had been used on several of the contestants, which according to him, gave both the judges and the viewers a twisted and wrongfully view of the show (Sam-Daliri 2010).

T-pain, the man who reintroduced the “Cher Way” of using excessive amount of Auto-tune received a surprising amount of negative feedback from the musical elitists (Futurism 2013). But when it surfaced that he could actually sing, the detestation was significantly toned down (Rhodan 2014). Is the hate only towards people who are put on the spot as being “unable to sing”? Looking at the majority of articles and blogs the evidence points toward just that.

If Auto-tune is used in these situations, where the person who “sings” is in fact unable to sing some say that performance is fake and that the artist is deceitful. Choir leader Gareth Malone

reacts harshly to the use of Auto-tune and calls modern pop music “plastic”, and if corrected from off-key to perfectly tuned it is definitely cheating. According to Malone songs from decades ago were often out of tune when performed, but the authenticity of the performance still remained and that resulted in a better performance overall (Silverman 2013).

The human factor

When talking about the human factor (which should not be confused with the human touch) it usually implies the errors that can be caused by humans in certain situations. The human factor plays an important role in the music production process even though almost everything is done in a digital environment. Pitch correction and polishing is not something that is automatically added, but rather subconsciously added by producers and studios these days.

The human factor is all the human, non-digital interaction with music. It is that certain grit in the voice, the slight variation on a verse or just simply the rough and authentic sound of a song. In certain situations the producer and studio technician are highly influential of the production, especially in pop music. In short the human factor is what sets us, the humans, apart from the digital world and it is something that philosophically cannot be altered digitally.

The human factor exists everywhere and can therefore be applied to any field where humans are involved (which as of 2016 is every field). Author Kim Vicente (2006) discusses several historical situations where the human factor has turned out to be both catastrophic and amazing. One of the most astonishing errors caused by the human factor was the Chernobyl disaster in 1987. The disaster was caused because of human recklessness and experimentation in an already unstable environment, this particular example being in a nuclear power plant. Nuclear reactors being highly complex and unstable if not handled according to instructions shows just how much of a catastrophe the human factor can cause. In this case, a meltdown was caused due to the fact that the workers deliberately disabled the safety system and pushed the already unstable system into a complete unbalanced state (Vicente 2006, p. 10).

The Chernobyl incident is of course an extreme example in comparison but the contents of it can be applied in a music production environment. An example being the forced use of Auto-tune in pop music. Many pop-stars do not write their own music and have little to no control over the effects and mix while recording their songs (Talt 2013). Instead these tasks are given either to the producers or the technicians. Nobody is forced to use Auto-tune or pitch correction, it is not an automated effect, but one that is added. There is always a choice when

it comes to adding effects like these and the use is a clear statement in many cases. Using tools like Auto-tune and excessive compression directly puts the track/song in question into a certain compartment. This compartment being the one that always gets criticized for taking shortcuts and not being authentic. The repercussions for these kinds of choices are that the singer or artist in almost all cases gets all the blame, when in fact it most likely was a producer's decision to add these kinds of manipulation effects.

The main thing in most pop music today is the cleanness and perfect sound. Everything is done in a professional studio environment, mixed by the top people in the industry and mastered to perfection. Everyone is basically using the same gear and software to achieve this type of sound (Clarkson 2015). Compression is a big part of it, you simply compress away the highs and lows to make it louder and to make it more tight. If we look at the history of compression usage in music production its main focus has been acoustic guitar and snare drums. In today's music everything is compressed, even the main mix and master channel.

Vicente continues with the question, "Why is technology so Out of Control?" (Vicente 2006, p. 29). The human factor can really only affect as much as the technology allows us to. Before pitch correction software was created, the process was almost undoable. This resulted in the fact that pitch correction was barely used. Today when every digital workstation on every computer is equipped with all the software, technology is partly the problem. The accessibility of the tools are a huge part of the "problem", not only in music production, but with technology in general. Actions that today take only seconds would, only 30 years ago, take hours or days. This gave everyone involved in the process the time to really reconsider certain actions, when today it is easy to just stack effects and edits on top of each other in matter of minutes. The concept of "less is more" is almost thrown out the window the second a DAW is opened due to the accessibility of all the tools.

Pitch is an important part of music, and one that has since the creation of pitch correction software, been laid in the hands of both the studio technician and the singer. The more in pitch the music is, the more unnatural and digital it may sound. This is easily heard and seen when you compare a song from before the Auto-tune and pitch correct era with a song today. Pitch is also the thing most commonly manipulated by studio engineers and technicians. Instead of leaving a section with a pitch that would by some be considered "bad" it is adjusted using software such as Auto-tune.

An introduction to sound, graphs and waves

What is pitch correction and why is it used in almost every song nowadays? To answer that question one must first understand what sound and pitch are and how they relate to each other. In this section Auto-tune, pitch correction and song analysis will be discussed.

At a physical level sound is simply a mechanical disturbance of the medium, which may be air, or a solid, liquid or other gas (Everest and Pohlmann, 2009, p. 1).

When working with pitch correction it is not the sound itself you're correcting and changing, but the audio signal that is being "fed" into the software. An audio signal can be portrayed graphically using a wave form spectrogram that measures time and frequency and draws a sound wave. An audio wave is either periodic or non-periodic (like percussive instruments). In short, Frequency is the number of occurrences of a repeating event per unit time (Everest and Pohlmann 2009, p. 69). Pitch is closely related to frequency, but not it is not the same thing. Unless the tone played is a flat sinus note, which is the basis of a periodic pitch, a tone consists of more than one frequency. Pitch is instead a united term for the frequency, length, time and strength of a tone. For example, it is not possible to establish the pitch of a sound unless the frequency is clear and stable enough to be distinguished from noise. Instruments that do not have pitch are considered non-periodic and can still be portrayed as a soundwave (Howard and Jamie 2009, p. 63). It is easy to think that pitch is an entirely complex and strange world with sound waves and frequencies, but the fact is that when working closely with it, using modern technology, it is relatively easy to understand. Imagine playing a song on your computer, the song has drums, guitars, bass and vocals. The waveform of this would look a mess, but it would still produce a pitch that could easily be established.

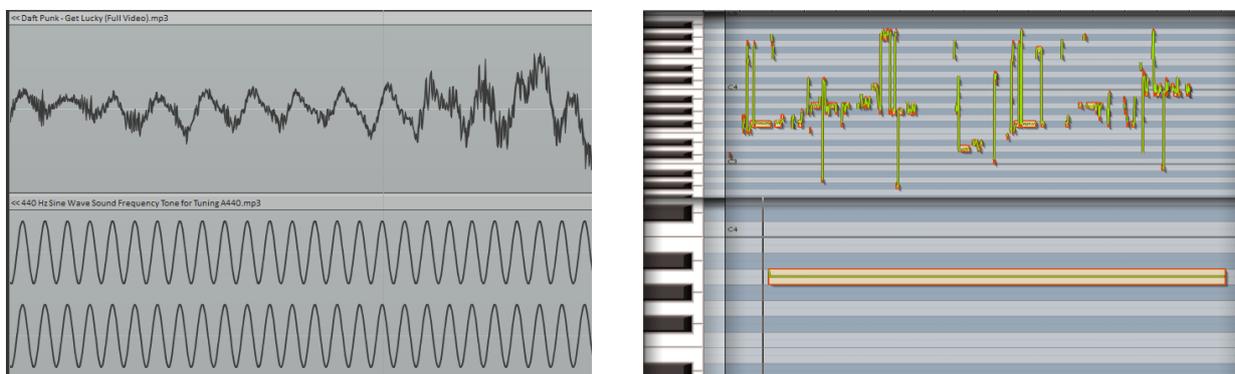


Figure 2.1 The difference between sound and pitch. To the left is Daft Punk's Get Lucky and a sinus tone depicted as sound waves. To the right is the same song and tone depicted as pitch graphs.

“Pitch is typically associated with our perception of the “highness” or “lowness” of a particular sound. Our perception of pitch ranges from the very general (the high pitch of hissing steam, the low pitch of the rumble of an earthquake) to the very specific (the exact pitch of a solo singer or violinist)” (Auto-tune 5 Manual, p. 13).

Pitch correction and Auto-tune

Auto-tune was introduced in 1997 by a company called Antares Audio Technology (Auto-tune 5 Owner’s manual 2006, p. 7). Pitch correction was possible before this, but it was a tedious process. It either required cutting of the physical media, re-recording or overdubbing the mistakes. All of this had to be done in the post process, meaning that there was little to none control over the real time process. Today it is possible to use Auto-tune in live situations instead of using playback, if the singer is having problems with a song (Marshall 2014). Auto-tune is used in almost every professional recording process and has received a lot of mixed criticism. It is frowned upon when used as a cover up for poor vocals, but accepted as an effect for people who can sing without the use of pitch correction (Marshall 2014). There are many different kinds of pitch correction software and during the analysis process I have looked at the three most prominent ones. Melodyne, Wave-Tune and the program that started it all, Auto-tune.

Ever since Antares released their groundbreaking invention Auto-tune (in the beginning of 1997) music has been moving “on a path” towards perfection. Perfection in the sense that it is almost inhumanly close to pitch perfect. When Cher released her song “Believe” in 1998 there was plenty of confusion regarding the sound of her voice. That was the first time Auto-tune was officially used in commercial music. What most people do not know is that the way Cher used Auto-tune was very unconventional, even though the software had not been out for long. The program was simply meant as a tool to manipulate frequencies, pitch and to help singers sound better on recordings. If the singer was low or too high on a certain part or section it could simply be corrected with the use of Auto-tune. The way Cher used it was to just max out the effect, and in that way achieving an almost robotic sound. This might have been what caused the outrage and confusion regarding Auto-tune, and is still what is generating lots of hate towards the software.

According to the manuals of the three software’s, their main function is to correct pitch. This is also one of the main critiques against the use of them, that they are being used as “cheats” (Silverman 2013). The programs are mainly described as being a “powerful intonation

correction tool". It is interesting that after almost 20 years after release, this is still their main description, especially since they have such a big and wide use. One of the first use of Auto-tune was with the song previously mentioned by Cher, "Believe". Cher used Auto-tune more as an effect, much like a Wah-pedal. Vocoder or a Delay. Looking at the usage of Auto-tune, it actually took a while until it was commercially used as intended. Pitch correction was in a sense available before 1997, but not accessible to the public in the same way. The early pitch correction software were slow and almost unusable if compared to Antares Auto-tune (Anderton 2006).

Auto-tune or pitch correction is used in almost every song today. Most of the time it is not even noticeable and it is only used in certain parts where the singer struggled or did not achieve the sought after pitch. Auto-tune is actually very rarely used throughout a whole song. In the small amount of cases, or the rather large if you're talking about pop music, it is because the singers are actually lacking the musical ability to produce tones that are on par with the pitch of the song. A sensitive subject, but still something that is being used at slander not too seldom, especially in pop-music.

Current well known artists like Ellie Goulding and Lorde are both continuously accused of using Auto-tune, but they strictly deny it. But who can really decide who can and cannot sing, especially when there is a program that will easily give you the answer to that question. That is why Auto-tune becomes interesting, because it can actually tell the user where the singer's voice is, pitch wise. If you are too low, you simply bump the curve up and you're in pitch, and if you are too high you lower the pitch curve. That little bump, that small little notch up to the right pitch, is that where the music stops being authentic and organic? That small little mistake, the human factor and error is that not what we want? What makes us unique and special if we can simply correct our mistakes?

In the technical section the mistakes, artifacts and curves are analyzed using the same methods they were created or removed with, by using pitch correction programs. Songs that have not been altered are looked at as comparison as a raw slate.

Analyzing pitch

As mentioned previously, the pitch correction and Auto-tune tools are much more than just manipulation tools. They provide empiric data that can be analyzed further with the help of the different perspectives mentioned throughout this essay. The programs used provide a similar user experience but with a slightly varied result.

Auto-tune (as seen in figure 2.2), the program that started the pitch correction trend gives a solid representation of the pitch and with a curve that is easy to follow. To the left hand side is the piano roll, displaying the notes, and to the right is the graph drawn out for analysis and editing. The main problem with Auto-tune is that it is not very user friendly and the version used here is quiet limited compared to Melodyne and Waves Tune.

Melodyne (as seen in figure 2.3) released in 2009 by Celemony is in many ways similar to Auto-tune. It uses the term “pitch correction” instead of “Auto-tune”, which has become sort of trivialized in the music world. Therefore established artists outside the pop-music world are not ashamed to admit they are using the software (Celemony). Melodyne is an easier tool to learn and provides a more comfortable user experience at first glance.

Waves Tune (figure 2.4), is part of the legendary Waves bundle that is used by almost every studio in the world. The software is described as a correction and manipulation tool for vocals and monophonic instruments. In that sense it is much like the other two programs. The difference with Waves is in the appearance and user experience. It is easy to learn and to edit, even for beginners. It also provides a much more user friendly interface that is easy to learn and get in to.

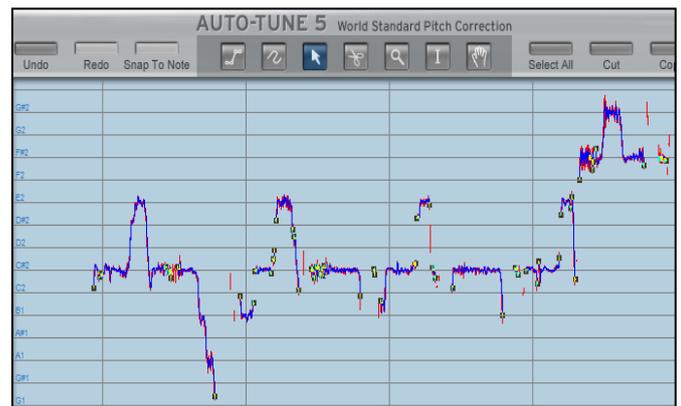


Figure 2.2 Kanye West Love Lock Down Auto-tune curve

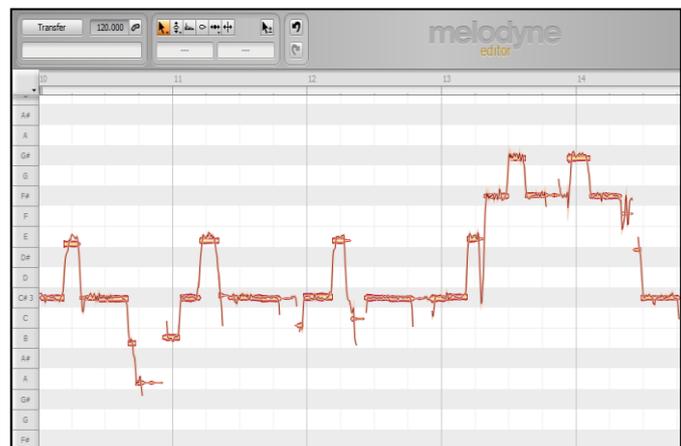


Figure 2.3 Kanye West Love Lock Down Melodyne Curve



Figure 2.4 Kanye West Love Lock Down Waves Tune Curve

To illustrate what can be achieved with the use of these three programs I have chosen three examples of music with isolated vocal tracks to analyze. To help establish whether or not the song is using Auto-tune or pitch correction I will be using three main focus points. The three most famous pitch correction software's offer much more than just Auto-tune. They also have tools for drawing graphs, time stretching and painting melodies for further analysis. As mentioned before, pitch is a combination of different factors in sound, and these programs help identifying the pitch and giving the user the ability to manipulate it freely. This method is based partly on scientific material from "Master Handbook of Acoustics" (Everest and Pohlmann 2009), basic music theory found in "Music Fundamentals" (Takesue 2014) and the book "Vad är det jag hör" (Ternhag 2009).

The software used in the analysis is Waves Tune. Mainly because it gives a solid and easy to read representation of the graphs and curves. Both Auto-tune and Melodyne provide similar curves and graphs but with a more cluttered and hard to read result. The main points used in the analysis are the following:

- **Pitch** (Takesue 2014)
 - How close to the desired note is the achieved pitch?
This is what the software is mainly used for, according to their manuals, to make sure the singer/instrument is placed correctly in pitch.
- **Vibrato** (Everest and Pohlmann 2009)
 - Is the vibrato natural? Does it sway only from the middle? Is it fixed, meaning that there is no variation?
The vibrato can both be created and erased using pitch correction software. The amount of "humanity" can be regulated from inside the software, giving the curves a more non-linear line.
- **Sound** (Ternhag 2009)
 - Is the sound natural, or is it obvious that it is manipulated?
The use of pitch correction software tend to give the sound and voice an unnatural feel. This is especially easy to recognize if an excessive amount is used. If pitch correction is only used on certain parts this can be hard to observe and establish.

The first example is an isolated vocal track from Bob Dylan. Looking at the curve in figure 2.5 and how it fluctuates, it can be assumed that it is either a natural curve or a skillfully manipulated vibrato, added on in post process effects. In an obvious case like this, the conclusion is easy to draw and you have many different ways of establishing the authenticity of the performance.

Looking at the pitch, it is clear that it is never in perfect pitch or exactly on a specific note. On the normal, comfortable notes it is slightly above, and on the higher notes it is slightly below. This is completely normal and it also tells us that the pitch has most likely not been tampered with.

The vibrato varies from every note, which means the performer is most likely using a natural non-digitalized vibrato. It sways from the center, no matter if slightly off pitch or on pitch. In an Auto-tune scenario it would only sway from the “on-pitch”-position. The vibrato is not fixed and has a different altitude and fluctuation throughout the analyzed section.

There are no signs of anything digitalized throughout the analyzed section when listening to the track. In extreme cases it is possible to hear immediately if Auto-tune has been used.

As seen in figure 2.6 the vibrato and the fluctuations are completely removed by the pitch correction. The old curve can still be seen behind the new curve as comparison. The sound is after the correction completely digitalized and “sterile” but it is still possible to hear that it is Dylan. His voice is recognizable through the correction and the artifacts that make Dylan “Dylan” are still present even though the pitch is now completely on the note.



Figure 2.5 Bob Dylan “Going Going Home” 2:09-2:13 in Waves Tune



Figure 2.6 Same section as 2.5 with excessive amounts of pitch correction

The second example is an isolated vocal track from Cher. If compared to the Dylan-example, it could almost be mistaken for a MIDI instrument based on the lack of fluctuation and how linear it looks (figure 2.7). It is blatantly obvious that this is manipulated using one or more pitch-correcting programs. This song was the first official song to use Antares' software Auto-tune. Interestingly enough, it was not used as the creators intended it to be used. Instead it was used as an effect, or almost as an instrument.



Figure 2.7 Cher "Believe " 0:13-0:17 in Waves Tune

Looking at the curve it is almost perfect and very much exactly on the line. When the note changes the line is almost straight. On certain notes, the curve resembles the pitch of a sinus wave, meaning it is almost surely been tampered with and enhanced. This particular section is where the Auto-tune settings are maxed out. This was most likely intentional and during the chorus of the song it is not as obvious that any manipulation software is being used.

The curve shows that there is little to no vibrato. This means it was either sung with zero vibrato or that the vibrato has been manipulated with a software. It is also extremely linear, meaning the vibrato curve was most likely re-done. This statement is based on the "sinus curve sections" where it sways almost perfectly. The effect could also have been achieved using Auto-tune.

The vocals sound robotic which most likely is as a result of software manipulation. This was either achieved by using a vocoder or excessive amounts of Auto-tune or a similar software. Since it is known that Cher was using Auto-tune this is a perfect example of the many different areas Auto-tune can be used in.



Figure 2.8 Same section as 2.7 but with added vibrato and fluctuation

When trying to automatically to add vibrato, fluctuations and variation with the program a it simply cannot be done. To attempt to give it the "human touch" a curve had to be drawn by hand. An example of what this would look like can be seen in figure 2.8. This does not sound natural and it is easy to tell that it is not an authentic performance.

The third and final example is an isolated vocal track from Britney Spears. Britney has always been accused of using Auto-tune, especially since she does a lot of playback, because of her on stage dance routines (Lansky 2014). On a first glance it might be hard to see signs of Auto-tune, especially when she is singing in her preferred range. Britney has a slightly limited voice and a pretty low preferred pitch. Her vocal type is *Soubrette* (3 octaves, 2 notes) and her range is from B2- G5 – Eb6 (F#6) (Criticofmusic 2012). This tells us that she should have problems with higher notes and that there may be pitch correction on those particular sections.

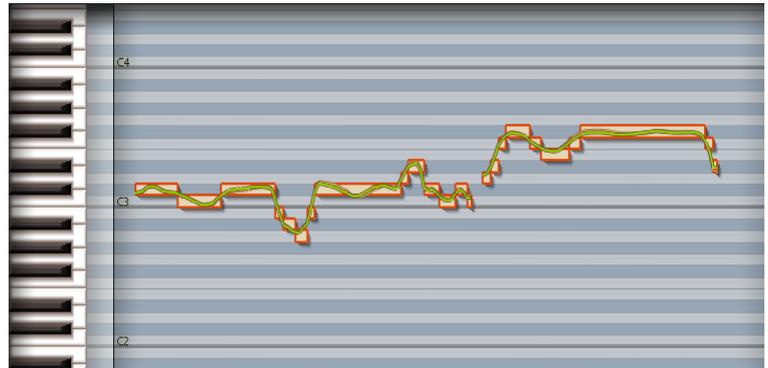


Figure 2.9 Britney Spears "Circus" 0:16-0:17 in Waves Tune

As seen in figure 2.9 she is always in pitch, but that does not mean she is using Auto-tune. As seen on the graph it is a bit twitchy and non-linear which would indicate signs of an authentic performance. Her preferred notes are most likely not using any noticeable Auto-tune. Looking at her higher notes it is more debatable. The fluctuation is very small and the pitch is very close to the line. There is very little variation on her longer, higher notes (figure 2.10) as well which would indicate some sort of manipulation.



Figure 2.10 Britney Spears "Circus" 0:32-0:34 in Waves Tune

The vibrato looks in some cases natural, but polished due to an automatic pitch correction. A natural vibrato would have less consistency and stray in different patterns from the center line. This is most likely achieved with a mix of digital vibrato and her actual vibrato. The sound is highly polished, slightly digitalized. The harmony section are clearly manipulated.



Figure 2.11 Same section as 2.10 but with added vibrato and fluctuation

Conclusion

The development of music and technology can create a world of mixed feelings. On one hand it creates new genres, new ways of production and unique opportunities that are not possible in an analog environment. The “surgical” control of the mix, sound and feel can be deceiving in many ways, but also extremely useful in many scenarios. On the other hand the tools and control remove some of the artifacts and personality in the process by either using too many polishing effects or simply by using automated and digital tools instead of the “real thing”. The accessibility of these tools are an important factor to the broad use seen in modern music today.

The questions asked in the hypothesis proved to be difficult to give a definite answer to. Instead new questions arose and a new level of understanding arose. The hope was not to give an exact answer, but to shed new light on the confusion and even anger towards using polishing effects and tools in music production

Maybe we are losing the human touch in music, or at least if we apply the new methods to old ways, such as authenticity. But in the year 2016, where almost all of the music is made and played on computers with a sound that would be described as unnatural and robotic, the framework surrounding authenticity must surely have evolved with the music. Perhaps not in writing, but in our heads. The academic framework surrounding authenticity feels dated and hard to apply to digital music. A song cannot simply be un-authentic because it was made purely on a computer. Which in theory all new digital and enhanced music would be if following the old frameworks from academic work based of Moore and Frifith.

Authenticity in music is not a solid thing stuck in time, but it feels like it when put in a new context. As long as music is evolving, so is authenticity and the framework that surrounds it. The ways of viewing genuiness and authenticity are perhaps dated and stuck in time, which is resulting in a naive and almost condescending attitude towards the digital and polished music that is flourishing today.

The technical control we have today is amazing. The fact that anybody with a computer and a digital audio workstation could produce, mix and master a song is something that could not have been foreseen. In the analysis in this essay I both applied and removed some of the factors that I believe are included in the human touch, to see if the performance was affected. Pitch correcting Dylan was a driving point, because surely that would remove the authenticity from the original song. The problem is that an already authentic performance proved hard to

alter, even when you are using an excessive amount of effects. It is almost like the genuiness cuts through all the added filters and manipulations “like a knife”. The same thing goes for a song that has already been altered, like Believe by Cher. No matter what you do to the song, the “soul” somehow still remains, and perhaps that is where the “problem” lies.

Spectrograms and graphs created by pitch correcting software such as Waves Tune turn out to be excellent material for further analysis. When a track has been manipulated it is fairly easy to spot it using one of the graphs from one of the programs. Same goes with an older, non-manipulated track. The fluctuations and waveforms then look alive and varied while, the manipulated digitally enhanced track generally look more linear in comparison. The examples chosen for this essay were in a way extreme, but they still prove a strong point when it comes to using pictures to analyze music, instead of actually listening to the track.

No one could really say if the human touch is desired or not in today's music. If it is “accidentally” removed by using modern technology, one could simply not use any modern technology and end up with an authentic result. Previously mentioned Jack White did just that, and in a way removing any confusion regarding authenticity and “cheats” such as pitch correction. But is forcing an authentic product really authentic? Honoring traditions is a huge part of authenticity and playing from the heart and soul is another. To actively think about authenticity as a main factor of your work could seem forced and fake. If one would wish for an authentic performance, just playing the things you want without worrying about frameworks or other people, would seem like the most authentic thing to do, no matter if effects are used.

Maybe it is not perfection we, the listeners are looking for, but it is the way it is become? The most perfect and polished might not actually be the best. Sometimes it is the uniqueness that is the most attractive in a piece of music. You might want to hear the person doing their thing, the thing that makes them unique instead of a perfected, polished product.

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Pictures

Auto-tune symbol used in figure 1.2

https://upload.wikimedia.org/wikipedia/commons/7/72/Anti-Tune_symbol.jpg

Compression comparison used in figure 1.1

<http://proguitarshop.com/media/cms/blog/BirdOnAWire-Compression2-Small.png>